Chhatrapati Shahu Ji Maharaj University, Kanpur

Answer Script Details
Barcode 6433489

Roll No. 24080022030
Total Mark 53/75.00

Exam MASTER OF SCIENCE _ODD EXAM-DEC-24
Subject B050702T - BIOSYSTEMATICS AND EVOLUTIONARY E

Question wise Mark Summary

Q.No	Mark	Q.No	Mark	Q.No	Mark	Q.No	Mark
1A	4/5						
1B	3/5						
1C	3/5						
1D	4/5						
1E	3/5						
1F	4/5						
1G	4/5						
1H	4/5						
1I	4/5						
2	NA/15						
3	10/15						
4	NA/15						
5	NA/15						
6	NA/15						
7	10/15						
8	NA/15						
9	NA/15						

Chhatrapati Shahu Ji Maharaj University
Kanpur, Uttar Pradesh

PART-II

Date of Exam: 23/01/2025 Shift: 1st Room No.: 25
Paper Code: B050702T Subject: Zoology Year/Sem: 1st
Name of Candidate: ALSHIFA ALAM
Roll No.: 2 4 0 8 0 0 2 2 0 3 0

COE Facsimile

Signature of Invigilator

Signature of Candidate

MARKS OBTAINED										
Q.	1	2	3	4	5	6	7	8	9	10
(a)										
(b)										
(c)										
(d)										
(e)										
(f)										
(g)										
(h)										
(i)										
(j)										
Total										
Total Marks in Figures									Max. Marks	
Total Marks in Words										

B050702T
Paper Code

Signature of Evaluator

Course: M.Sc. (Regular) 1st
Session: 2024-25 Year/Semester:
Subject Name: Zoology
Medium: English ● Hindi ○

महाविद्यालय का कोड College Code: K N 0 4

परीक्षा केन्द्र का कोड Exam Centre Code: K N 0 4

Paper Code: B 0 5 0 7 0 2 T

Exam Date: 2 3 0 1 2 0 2 5

Name of Candidate: ALSHIFA ALAM

Father's Name: MOHD ALAM

परीक्षा का प्रकार Type of Exam
Regular ● Ex-Student ○
Private ○ Back Paper Exam ○

ANSWER BOOKLET NO.
6433489

B050702T
Paper Code

Enrollment Number: C S J M A 2 4 0 0 0 0 0 1 3 7 8 9

Candidate's Roll Number: 2 4 0 8 0 0 2 2 0 3 0

Paper Code: B 0 5 0 7 0 2 T

Alshifa Alam
Signature of Candidate

Signature of Invigilator

C S Facsimile

COE Facsimile

नोट- 1. परीक्षार्थी को निर्देशित किया जाता है कि आवरण पत्रे को पृष्ठ भाग पर अंकित सभी निर्देशों को सावधानी पूर्वक पढ़ें।
2. बॉक्स में भरी जाने वाली प्रविष्टियां स्याही से शुरू की जायें। 3. गोलों को काले या नीले बॉलपेन से भरा जायें।

INSTRUCTION TO THE CANDIDATE FOR FILLING PART-I

1. Read the instructions carefully given on the answer script and admit card.
2. Write Date of Exam, Shift, Paper Code & Name of Subject Correctly.
3. Write Name & Roll No. Correctly.
4. Write Semester & Branch Correctly.

INSTRUCTION TO THE CANDIDATE FOR FILLING PART-III

1. Use blue or black ball point pen for writing alphabets & numerals in ☐ boxes.
2. Carefully study the example before you start marking.
3. As shown in the example below, blacken thecircles completely.

4. Make no Stray marks o n this sheet.
5. **DO NOT WRITE OR MARK ON THE BAR CODE.**

IN ORDER TO AVOD UFM (UNFAIR MEANS) :

1. The Roll No. and Answer Book no. found elsewhere or any other symbol found in the answer book will be treated as unfair means.
2. Any tempering of Bar Code and Booklet no shall be treated as Unfair Means.
3. Do Not bring the materials like slip of paper/mobile/digital diaries/ study material/ revision notes in examination hall. Possession of the mobiles/ digital diaries/electronic/digital/ watch and any other electronic gadget except memory less scientific calculator shall be considered as UFM case.
4. Do not keep or paste currency note in answer script it shall be consider as UFM."

अनुचित साधन से बचने हेतु :

1. उत्तर पुस्तिका के निर्देशित स्थान को छोड़कर अनुक्रमांक एवं उत्तरपुस्तिका का क्रमांक कहीं और न लिखे तथा कोई भी चिन्ह न बनायें क्योंकि यह अनुचित साधन प्रयोग की परिधि में आता है।
2. उत्तर पुस्तिका के बारकोड अथवा उत्तर पुस्तिका संख्या पर छेड़ छाड़ करने पर अनुचित साधन प्रयोग माना जायेगा।
3. परीक्षा कक्ष में निम्न वस्तुएं साथ न लायें, जैसे लिखे हुए कागज के टुकड़े, मोबाईल, डिजिटल डायरी, डिजिटल घड़ि, घड़ी, पुस्तक यह सभी वस्तुएं जो अनुचित साधन के अन्तर्गत आती है। कोचार संबंधित प्रश्नपत्र में ही मेमोरी लेस साइंटिफिक कैलकुलेटर ले जाने की अनुमत्रता होगी।
4. उत्तर पुस्तिकाओं में कागजें न रखें न ही उत्तर पुस्तिका में चिपकायें। ऐसा करना अनुचित साधन प्रयोग की परिधि में आता है।

परीक्षार्थियों के लिए निर्देश

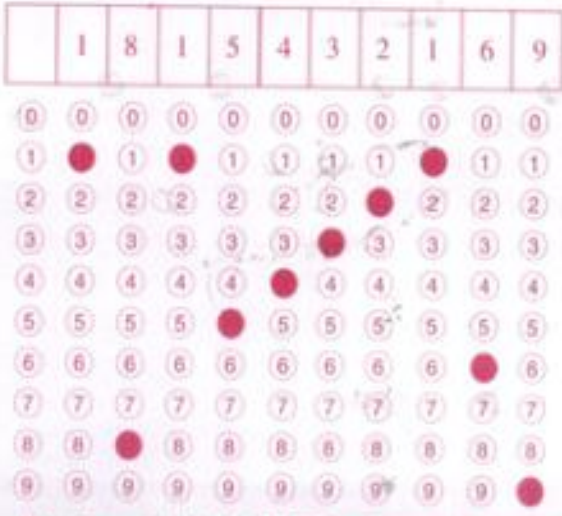
1. प्रवेश पत्र एवं उत्तर पुस्तिका पर दिये गये निर्देशों को ध्यान से पढ़ें।
2. उत्तर पृष्ठ के दूसरी तरफ कुछ न लिखें।
3. उत्तर पुस्तिका के पृष्ठों पर दोनों तरफ लिखें।
4. प्रश्न पत्र पर अपने अनुक्रमांक के अतिरिक्त कुछ न लिखें।
5. प्रश्न पत्र कोड एवं प्रश्न पत्र ID सावधानी पूर्वक लिखें।
6. अपनी स्थिति स्पष्ट लिखें।
7. उत्तर पुस्तिका के पृष्ठों की संख्या देखें। अगर उत्तर पुस्तिका में पृष्ठ (1-24) से कम है या कटे हुए हैं, तो परीक्षा शुरू होने के पूर्व दूसरी उत्तर पुस्तिका ले लें।
8. प्रश्नपत्र को देख, यदि प्रश्नपत्र के विषय कोड, विषय का नाम तथा प्रश्न में कोई त्रुटि है तो उसकी परीक्षा होने के 30 मिनट के अन्दर कक्ष निरीक्षक को तत्काल सूचित करें, उसके बाद विश्वविद्यालय द्वारा कोई बात नहीं की जायेगी।
9. प्रश्नों के उत्तर लिखने के लिये पेंसिल का प्रयोग न करें।
10. दी कोपी या अतिरिक्त ग्राफ नहीं दिया जायेगा।

INSTRUCTION TO THE CANDIDATE

1. Read the instructions carefully given on the Question Paper, Admit Card & Answer Script.
2. Do not write anything on back side of the cover page.
3. Write on both sides of pages of answer book.
4. Do not write anything on question paper except Roll Number.
5. Write Paper Code & Question Paper Id carefully.
6. CHECK the number of pages (1-24) or any other kind of damage in your answer script, if found than change the answer script immediately before the commencement of examination.
7. CHECK the Question Paper for any kind of discrepancy e.g. Subject Code, Sut Name, and Question of the Question Paper during first THIRTY MINUTES of th commencement of the exam, so that it can be corrected in TIME. After that no corrections shall be entertained by the university.
8. Do not use pencil for answering the question.
9. Write status correctly e.g. those appearing in carry over papers should fill in statu as Carry Over. Those appearing as Ex- Students should fill in status as ex.
10. No supplementary answer book & graph paper will be provided.

INSTRUCTION TO THE CANDIDATE FOR FILLING PART-IV

1. Use blue or black ball point pen for writing alphabets & numerals in ☐ Boxes.
2. Use blue or black ball point pen for filling the circles.



Note- If your Roll No. is of 10 digits. Please leave first three columns .

Paper Code
B050702T

1

(SECTION- A)

Short Answer Type Questions

Ans. 1(a)

Bottleneck effect -

In bottleneck effect the frequency of certain alleles in the population changes because the organisms that carry them are eliminated, while the other increase in number because it is the only allele left in the population.
It is observed during natural calamalities such as Earthquake, volcanic eruption leading to death of the most of the population.

Alleles of one gene in original population

Alleles frequency decreases during due to natural disasters

surviving individual with changed allele frequency

New population arise different from parent population.

Ans. 1 (b)

Molecular taxonomy

Molecular taxonomy is the branch of taxonomy that uses the biomolecular data such as DNA, RNA, proteins, amino acids etc. to study the evolutionary relationship b/w the species.

Any organisms can be differentiated at the molecular level

Higher differences → more distantly related.

Types of Molecular taxonomy

1) Micro molecular taxonomy :- Uses low molecular weight compounds such as amino acids, alkaloids etc.

2) Macro molecular taxonomy :- Uses high molecular weight compounds such as DNA, RNA, proteins, polysaccharides etc.

Paper Code
B050702T

3

Advantages of Molecular data:-

1) Molecular data are robust
2) Less time consuming
3) Molecular data are strictly inherited.

Applications of Molecular taxonomy

1) stabilize evolutionary relationship between individuals
2) Construct phylogenetic trees between individuals.
3) Used in pharmaceutical sciences.

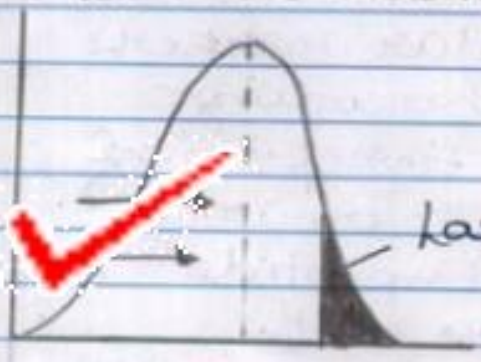
Techniques /Tools of Molecular taxonomy.

1) PCR
2) Molecular markers
3) DNA barcoding
4) DNA fingerprinting
5) DNA microarray.
6) Single Nucleotide Polymorphism
7) Multiplex PCR
8) Size differential PCR.
9) AFLP
10) RAPD

Ans. 1(c)

Directional selection

- Directional selection produces regular change in the gene pool of population ~~with~~ in one direction with respect to one or more specific characteristics.
- It is a progressive selection and produces or sets an evolutionary trend within the population is seen in response to directional changes occurring in the environment.
- Ex - ① Evolution of horse, Man and Camel
  ② Industrial Melanism



Paper Code
B 0 5 0 7 0 2 T

5

Ans. 1 (d)

Nominalistic species concept.

Nominalistic species concept was the concept of Occam and his believers / followers of the believe that nature only produces individuals, species are the concept of Man-Made in nature they lack definite existence. This concept do not have any scientific basis.

It believes that species are produced to refer to big number of individuals simultaneously. In France during 80's this concept was in demand. Even now it has been used by some botanists.

Drawbacks :—

- No biologist can agree with the fact that species are man-made, when it is now an established fact that they are product of evolution.
- Simpson suggest that taxon of organisms are created not only looking similarity among individuals but they share a common ancestor.

Ans. 1 (c)

Law of priority

- Law of priority is one of the guiding principle of ICZN, defined in article 23.
- It stated that the correct formal name of the animal, the name to be used called valid name is the oldest applicable name that is available provided that the name is not prohibited / invalited by any provision of code or any rulings of commission.
- In 1815, George Ord named a species of leghorn as Antilocarpa americana In 1848, the John Edward published the same species as Antilocarpa antiflexa. So by the law of priority the name Antilocarpa americana takes the priority while the name antilocarpa antiflexa become its junior synonym.
- Law of priority stabilizes the names of biological species.
- Law of priority is applicable to names which are published after 01/01/1758.

Paper Code
B0507.02T

7

Ans. 1(f)

Frameshift mutation :—

- It is the addition or loss of one or more nucleotides in the DNA segment.
- Since genetic codes are commaless both addition as well as deletion shift the reading frame of codon from the site of change onwards.
- It changes the sequence of amino acids in the polypeptide chain, the new polypeptide chain may be formed entirely different from the normal one, it can be modified, deleterious or inactive.
- Eg. Muscular dystrophy in man is caused by frame shift mutation.

ACT TAG TTA

Original DNA with triplet base

Insertion of A ↙ ↘ Deletion of C

ACA TTA GTT A...

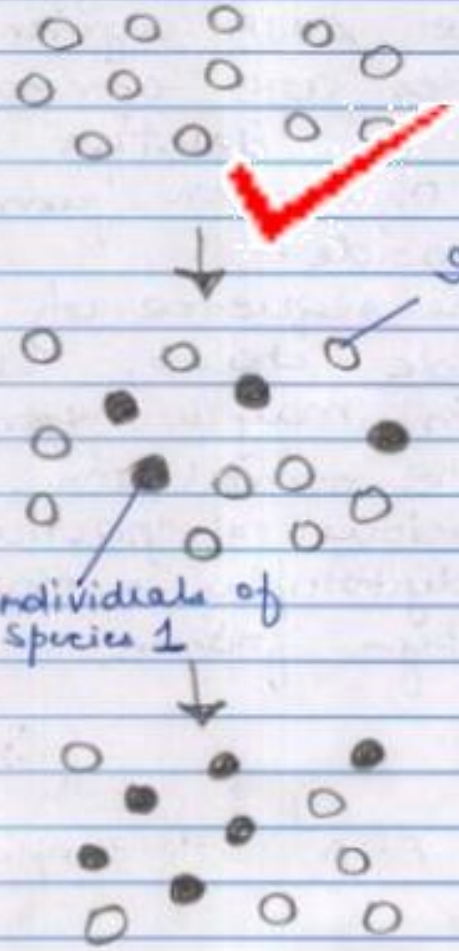
ATT AGT TA...

Modified DNA with modified triplets

Modified base triplets after the site of change onwards

Ans. 1(g)

Sympatric speciation



- Sympatric speciation occurs within the same geographical area and within the same population.
- The individuals of same population

become reproductive isolated to each other by the development of biological isolating mechanisms such as -

→ Gene mutation → Seasonal reproduction
→ Behavioural cha → Reproductive isolation
→ Preference change → Change in allele frequ

- In plants, excellent example of sympatric speciation is the plant produce by polyploidy

Ans. 1(h)

Sewall wright effect.

- The random and sudden change in the allele frequency occuring in small population due to chance alone is called Sewall Wright effect or Genetic drift
- It occurs by Bottleneck effect and Founder effect.
- Founder effect :- The Genetic drift can cause dramatic changes in the frequencies of alleles in a population derived from some founder members who entered the new /isolated geographical

region.
These founder member carry only limited portion of parental gene pool. Their gene pool may be homozygous for certain alleles thus lacking other alleles for those characters.
It means different founder colonies will posses different gene pools and will become different from one another and from parental population. Such an effect is called founder effect.

Original population

New population arising from founder members.

Effect of Genetic drift

1. Fixation of new mutations
2. reduces the variations
3. Non adaptive changes.

Paper Code
B 0 5 0 7 0 2 T

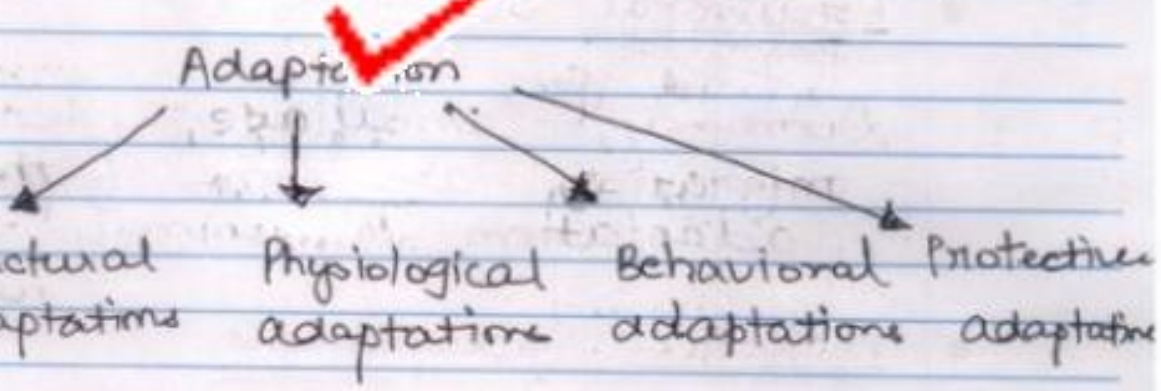
11

Ans. 1 (i)

Evolutionary significance of Adaptation.

- Adaptations may be defined as the fitness of an organism to live in its habitat/ environment.

- Adaptation includes morphological and physiological changes in the organism to better adapted to its environment.



- Structural adaptations :— These are the changes in the structure of an organism to better adapted to its environment.

It includes — Cursorial adaptations
Fussorial adaptations
Aerial adaptations
Aquatic adaptations
Desert adaptations
Scansorial adaptations

- **Physiological adaptations**

These are changes in the cellular structure, internal organs, changes in the hormonal hormonal level, mood swings that help an organism to survive, adapt and respond to the changes in environment

Ex- Venomous animals produce poison to capture prey.

- **Behavioral adaptations**

Dormancy, Camouflage, hibernation, migration are some of the behavioural adaptations in animals and plants.

- **Protective adaptations**

It includes → Camouflage
→ Protective exoskeleton
→ Mimicry.
→ Venomousness
→ Distastefullness

These are for the protection from the predators.

Paper Code
B050702T

13

(SECTION-B)

Ans. 3

Biological species concept

- First K. Jordan (1905) gave the definition of biological species concept.
Later Mayr proposed the biological species concept in (1940).

- According to Mayr,

Species are is the group of interbreeding population which is reproductively isolated from other such groups.

According to Mayr, Biological species has following three properties

① Reproductive Community:— The members of the same species form a reproductive community because the individuals of species see each other as potential mates for the purpose of reproduction.

- Only the members of the same species can reproduce and form offsprings.
- Some times individuals of different species reproduce to form sterile species

Ex. Horse + Donkey = Mule

2) Ecological Unit :-

- The members of the species differ each other for many features but togetner they form an ecological unit.
- They ~~inter~~ intersect as a unit with otter species in any environment.

3) Genetic unit

- The members of the species freely interbreed consisting of intercommunicating gene pool and form Genetic unit.
- Individual is merely a temporary vessel carrying a small content of the parental gene pool.

Drawbacks :-

It has following drawbacks :-

① Fossil record :- It is a unidirectional concept, as it deals with only living species and not with extinct species. We find certain animals in the fossil record. It is very difficult to place them in any single species.

(3) In Controlled Environment Condition

When scientist placed allopatric species together in controlled environment conditions then not only different species but also different genera began to reproduce each other.

(4) In natural Condition

In natural condition also different species began to reproduce each other and produce sterile individuals

Eg:- Horse + Donkey = Mule

(5) Asexual reproduction :-

Biological species concept is applicable to only sexually producing plants and animals but what about bacteria, fungi, virus and other asexual reproductive methods such as parthenogenesis.

Evolutionary species concept

All taxonomist, specially palenteologist was not satisfied with the biological species concept, they want ~~defi~~ species definition based on evolution.

Simpson definition of Evolutionary species -

An evolutionary species is a lineage evolving separately from other and with its own evolutionary role and tendicies.

Drawbacks:-

Scientists were disagreed with the above defination of species.

- They stated that above defintion is about phyletic lineage and not indicate species concept.
- Evolutionary species concept was applicable to only isolated populations and incipient species and not to individual species.
- It did not also indicate the time periord for the species.
- Simpson tried to solve these problems but the result was not satisfactory.

Paper Code
B050702T

17

(SECTION-C)

(Ans. 7)

Mutation

Mutation are sudden, random, discrete, discontinous heritable changes.

Mutation can be three types -

(i) Gene mutations
(ii) Chromosomal Abberations
(iii) Genomic Mutations

Gene mutations

It can be caused by Frameshift or Substitution mutation -

- Frameshift mutation:- It is the addition or loss of one or more nucleotides in the DNA segment.

- Substitution Mutation:- It can be caused by (i) Transition (ii) Transversion

(i) Transition:- Replacement of purine with another purine and pyrimidine with another pyrimidine.
A≡T is replaced by G≡C and vice versa

(ii) Transversion :— A=T is replaced by T=A
G≡C is replaced by C≡G.

Chromosomal abberations

⇒ Change in the structure of ~~of~~ chromosom
It is of following types
- Deletion
- Inversion
- Duplication
- Translocat

⇒ Genomic mutations :—

Changes in the number of chromosomes of organism.

It can be two types —

① Euploidy :— Addition of or loss of one or more chromosomal sets in the diploid genome.
It can be haploidy or ~~hyp~~ Polyploidy.

② Aneuploidy :— Addition ~~of~~ or loss of one chromosome in the diploid genome ... is of following types
Monosomics (2n-1)
Nullisomics (2n-2)

Polysomics ⇒ • Trisomics (2n+1) Ex- Down syndroma
• Tetrasomics (2n+2) Ex- Superfemale in mark.

Genetic drift :-

- The sudden, random changes in the frequencies of alleles occuring in a small population by chance event is called Genetic drift
- Genetic drift leads to the divergence between the populations.
- Because of Genetic drift the mutations occuring in a small population may be either fixed or loss irrespective or to being benefited or harmful.
- It is caused by Bottlereck effect and Founder effect.

Isolation :-

Mechanisms that reduces the chances of reproduction between the related group of organisms are called isolating mechanism

Reproductive isolation can be achieved by :-

Prezygotic reproductive isolation Mechanism

① Habitat isolation :- Isolation shown by the populations living in the same region but occupy different habitat so that potential mates do not meet.

(2) Seasonal isolation:- populations are in same geographical region but become sexually mature at different time period so that potential mates do not meet.

(3) Ethological isolation:- Isolation due to different sexual behavior before mating so that potential mates meets but not mate.

(4) Mechanical isolation:- Isolation due to difference in the structure of reproductive organs.

Post zygotic Reproductive isolating mechanism

(1) Gametic mortality:- Sperm transfer takes place but egg & do not fertilise.

(2) Zygotic mortality:- Fertilized egg but zygote dies.

(3) Hybrid inviable:- Zygote produce F1 of weak or inviable.

(4) Hybrid sterility:- Zygote produces F_1 sterile due to either developmental hybrid sterility

or segregational hybrid sterility.

(5) F_2 breakdown:— F_1 is fertile, vigrous and normal but F_2 cohsits of many sterile or inviable individuals.

Reproductive isolation is essential for the accumulation of geretic variations. Reproductive isolation promotes geretic variations and evolutionary divergence. Without reproductive isolation, the various mutant forms would freely interbreed with the normal form leading to the intermixing of their genotypes.

Paper Code

22

Do Not Write anything in this Portion

Paper Code

23

X

X

Paper Code

24

Do Not Write anything in this Portion